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FORMALIZATION THE TASKS OF SELECTING OPTIMAL PARAMETERS FOR BALANCING OF LOADING SERVERS IN IMS SUBSYSTEM

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ABSTRACT

Annotation

Nowadays, users of the internet are becoming increasingly popular, because of this rising load packets of network and delay requests. In this paper, we offer a method to improve allocation resource in the IMS servers. Implementation of technology for balancing of loading in practice allows to optimize the decision of distribution tasks of signal and information flows on telecommunication networks. In case of uniform loading of the IMS servers and routers of a backbone network (devices of the network), the average time of a time delay of signal and information packets is minimum. Uniformity of loading of network devices is reached due to the uniform distribution of a flow of packets. The criterion of efficiency of methods of distribution of flows is the average square deviation (a balanced index) of congestion of network devices.

KEYWORDS: IMS (Ip Multimedia Subsystem), CSCF (Call Session Control Functions), SIP & PSTN

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Original Article

INTRODUCTION

In case of loading 0.18 loading of S-CSCF of the server come nearer to unit and the average time of a time delay of a request aims at infinity. At the same time, other servers aren't overloaded. In the investigation of it, the criterion of balance sharply increases (see figure 1). Therefore in case of uniform distribution of the shared computing resource the subsystem of IMS functions steadily only when loading is less than 0.17 (see a figure 2). In the case of loadings, it is more than 0.17 mean values of a time delay of connection establishment sharply increase in case of the SIP-SIP and SIP-PSTN procedures which don't satisfy set norms 2 with.

In case of uniform distribution of the shared computing resource of the IMS server are loaded non-uniformly (figure 1)

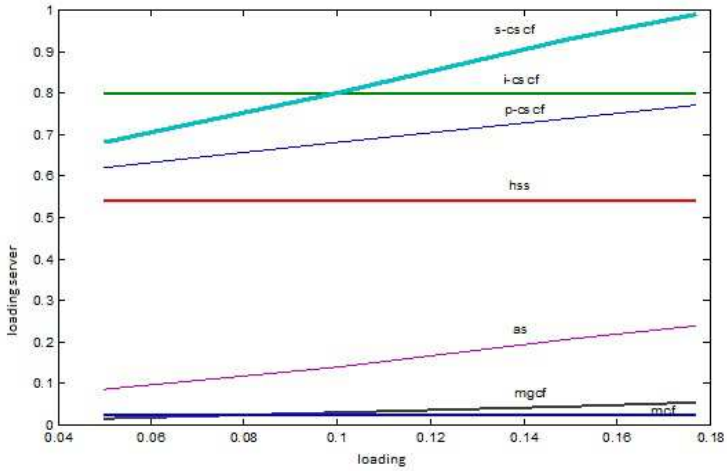

Figure 1: The Diagram of the Dependence of Loading of the IMS Servers on Loading in Case of Uniform Distributions of the Shared Computing Resource

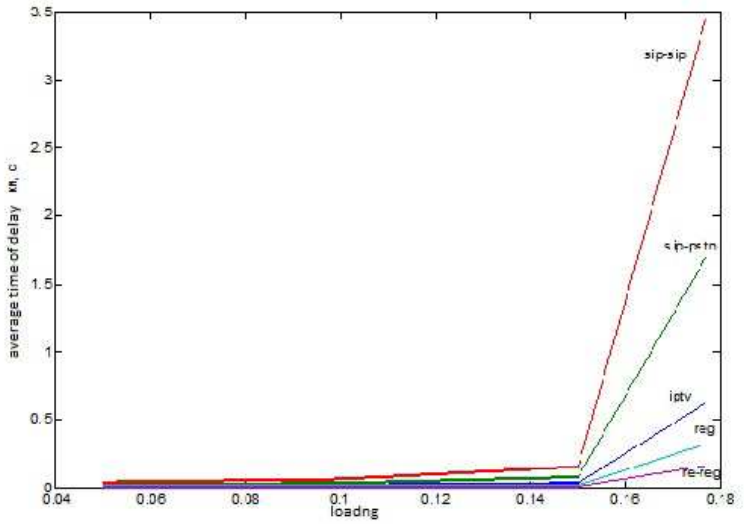

Figure 2: Dependence of the Average Time of a Time Delay of Requests on Loading in Case of Different Procedures of Connection Establishment and Uniform Distribution of Summary Intensity of Service

It is necessary to distribute optimum the shared computing resource (summary intensity of service of requests) for the purpose of balancing of loading of the IMS servers.

We determine the best values of intensity of service of requests by the rule of "square root $\mathbf{M}_{iopt}$ in IMS subsystem devices in case of the summary intensity of service $\mathbf{M}_{sum}$

$$\mathbf{M}_{iopt} = l_i + \frac{\mathbf{M}_{sum}(1-R)\sqrt{l_i}}{\sum_{i=1}^{n}\sqrt{l_i}} \quad (1)$$

$$R = \frac{1}{\mathbf{M}_{sum}}\sum_{i=1}^{n} l_i \quad (2)$$

where R – the general loading of a subsystem of IMS, l_i-the intensity of arrival of requests for input servers.

In table 1 the best values of intensity of service of requests in the IMS servers are reduced.

Table 1: Optimum Allocation of the Summary Intensity of Service of Requests between IMS Subsystem Servers

IMS Subsystem Servers	Best Values of Intensity of Service of Requests in Servers in Case of Different Loadings		
	0.3	0.5	0.7
P-CSCF	8861	8839	8824
I-CSCF	7672	6052	4996
HSS	5234	4192	35132
S-CSCF	12497	1362	14350
AS	3746	4804	5493
BDCF	879	1156	1335
MDCF	879	1156	1335
MCF	232	181	154
Summary intensity of service (requests/sec.)	40000	40000	40000

In case of best values of intensity of service of loading of servers are balanced (are identical) (figure 3)

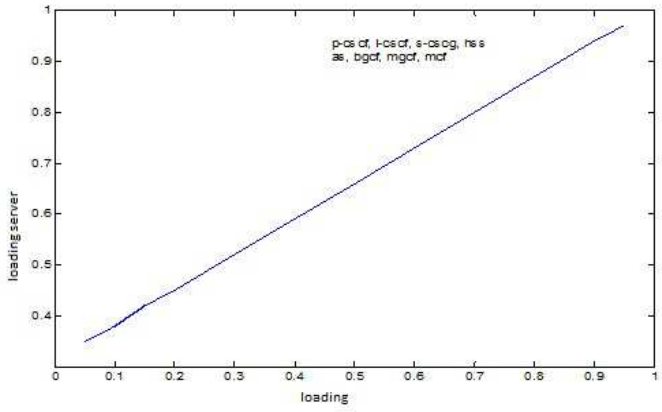

Figure 3: Diagram of the Dependence of Loading of the IMS Servers on Loading

Balances of loading of servers are a result of an increase in the area of steady functioning of a subsystem of IMS up to loading 0.9 (figure 4).

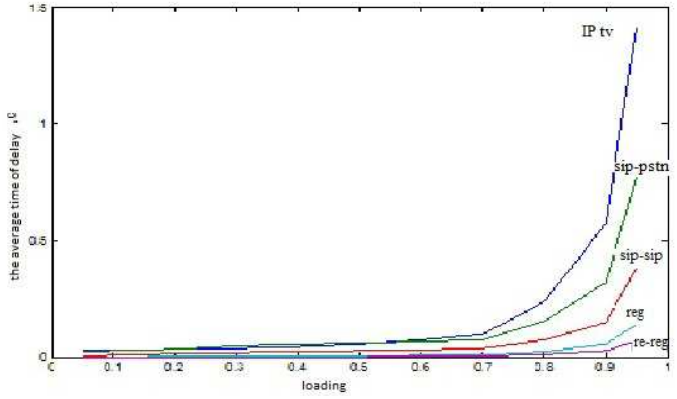

Figure 4: Diagram of the Dependence of the Average Time of a Time Delay of Requests in the IMS Servers in Case of Different Loadings

Thus, the criterion of balance (1) in case of the optimum intensity of service of requests in servers several tens of times is less than in case of uniform than service intensity in areas average and high loadings (figure 1).

The diagram of the dependence of criterion of balance on summary high-speed performance (intensity of service) of servers in case of a permanent load 0.4, optimum allocation of high-speed performance and the linear dependence of cost of the server from the high-speed performance of the server is given in figure 5.

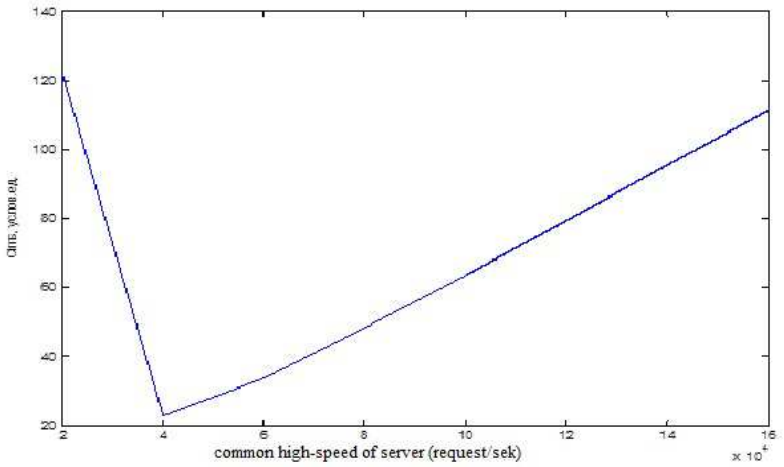

Figure 5: Diagram of the Dependence of Criterion of Balance on the Summary High-Speed Performance of Servers

From figure 5, it is visible that the minimum value of criterion of balance is reached in case of the general of high-speed performance (intensity of service) of servers of 40000 requests/sec. The criterion of balance decreases to summary intensity of service of 40000 requests (requests)/sec. because of the reduction of the average time of a time delay of requests, and further leads increases in the summary intensity of service to increase in the criterion of balance because of the increase in coefficients of idle times of servers. In the same way, it is possible to define the summary intensity of service in case of which the criterion of balance has the minimum value for each value of loading.

CONCLUSIONS

Nowadays, services of telecommunication are rapidly increasing, as a result, we can come across some problems such as in term of traffic resource. For decide one of these, we selected optimal parameters of the IMS subsystem. In the calculated time of service, wait time in the queue of request, time of delivery of the message to UE(user equipment), like that parameter for each function of the IMS subsystem. And reflected by the diagrams and tables. It also selected optimal parameters from the tables. As well as the task of selecting the optimal values of server performance for a given cost of the IMS subsystem and the task of choosing the optimal speed of the servers is reduced to minimizing the function with constraint. In order to propose, selecting the optimal parameters of the speed of server performance by limiting the connection time. As a result, we can see increasing significantly the speed of servers in the section.

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